

Electra Mars Proximity Link Communications and Navigation Payload Description

Scout orbiter missions with mission lifetimes of one Mars year or more in Mars orbit are required to carry a UHF relay communications payload for feed-forward provision of in-situ telecommunications and navigation services to subsequent Mars Exploration Program (MEP) missions. The Mars Exploration Program will provide the UHF relay payload to the scout project, based on the Electra UHF relay payload that is scheduled to fly on the 2005 Mars Reconnaissance Orbiter. MEP is responsible for the cost of the scout orbiter Electra payload, and that cost is not counted against the project cost cap. The project, though, is responsible for all costs associated with integrating the Electra payload on the spacecraft, as well as the necessary ground data system/mission operations system development costs needed to enable on-orbit operation of the payload; these costs are part of the scout mission cost cap. (However, any incremental Phase E Operations costs associated with the provision of relay services by the scout orbiter to MEP-designated missions will be borne by the Mars Exploration Program and are also outside of the scout mission cost cap.)

This section provides a high-level description of the Electra payload interface to assist proposers in incorporating this payload into their orbiter design. Applicable Scout orbiter proposals shall include the Electra payload in the overall spacecraft block diagram, and include appropriate Electra mass and power allocations in the overall spacecraft design.

Figure 1 depicts a simplified block diagram of the Electra payload, highlighting the primary payload elements and payload interfaces with the spacecraft bus. Table 1 lists

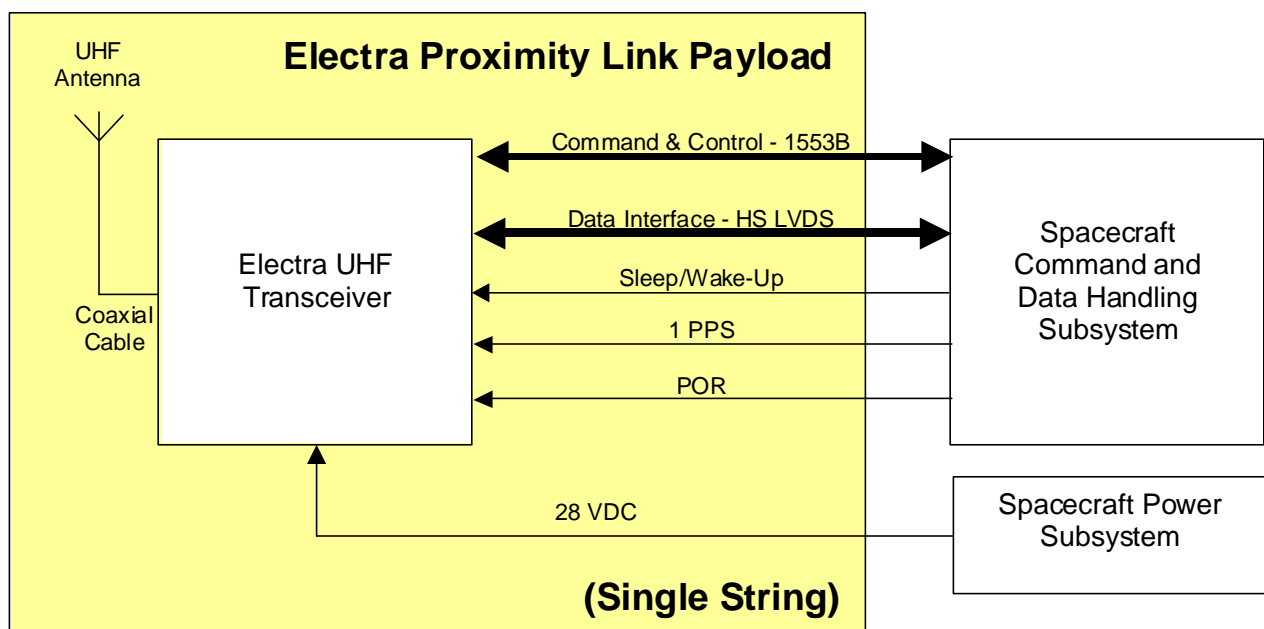


Figure 1: Electra Proximity Link Payload block diagram

the payload elements and masses. The total estimated mass for the single string payload is 7.5kg (no mass growth contingency added). Accommodation of the payload on the spacecraft requires placement of the UHF low gain antenna such that it can be pointed in the nadir direction, with a clear field-of-view over a cone angle of ± 60 deg relative to the antenna boresight.

Electra Payload Element	Mass (kg)	Volume (cm³)
Single String Electra UHF Transceiver	5.1	21.7d x 17.0w x 13.7h
UHF Low Gain Antenna (including coaxial cable to transceiver)	1.8	Cylindrical envelop of: Base=23, Dia=16,Height=31
Cabling for payload-spacecraft interfaces	0.3	
Mounting Hardware	0.3	
TOTAL (Current Best Estimate)	7.5	

Table 1: Electra payload elements and mass/volume estimate

The Electra payload has a number of interfaces with elements of the spacecraft bus, including the spacecraft command and data handling subsystem and the spacecraft power subsystem. These interfaces are summarized in Table 2.

Electra Payload Interface	Description
Command and Control	Redundant, cross-strapped 1553-B physical interface with 1553 protocol
Proximity Link Data (Forward and Return)	High Speed Low Voltage Differential Signaling (HS-LVDS)
DC Power	28VDC
1 Pulse-Per-Second (1 PPS) timing	Direct Analog Line
Power-on-Rest (POR)	Direct Analog Line
Sleep/Wake-Up	Direct Analog Line

Table 2: Electra payload- spacecraft bus interfaces

Current best estimates of power consumption by the Electra payload in each of its operating modes is summarized in Table 3.

Electra Operating Mode	DC Power (W) (Current Best Estimate)
Sleep	6.8
Standby	14.3
Receive Only (Half Duplex)	22.2
Transmit Only (Half Duplex)	64.8
Transmit and Receive (Full Duplex)	68.0

Table 3: Electra payload power consumption

For more detailed information on the Electra Payload specifications and characteristics, contact:

Eric Schwartzbaum
Electra Payload Project Manager
Jet Propulsion Laboratory
M/S: 238-540
4800 Oak Grove Drive
Pasadena, CA 91109-8099
Phone: 818-393-2604
Fax: 818-393-6686
E-mail: Eric.Schwartzbaum@jpl.nasa.gov